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Original Article

A STUDY OF HAEMATOLOGICAL PROFILE OF MEDICAL AND PARAMEDICAL STUDENTS IN NORTH BENGAL MEDICAL COLLEGE AND HOSPITAL WITH SPECIAL REFERENCE TO ANAEMIA AND HAEMOGLOBINOPATHIES

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ABSTRACT

BACKGROUND

In India, over half of women and 24% of men suffer from anaemia. Classification plays an important role in anaemia. The study was undertaken to screen about anaemia and haemoglobinopathies among young medical and paramedical students of Notrh Bengal Medical College who are likely to make their family in recent future.

METHODS

In our hospital based cross-sectional study, 500 medical and paramedical students of North Bengal Medical College were screened for anaemia and haemoglobinopathies for a period of one year.

RESULTS

Anaemia is more prevalent in the study population. Anaemia has no significant association with BMI and socioeconomic status. Most common morphological pattern of anaemia among anaemics is microcytic hypochromic anaemia. HbE and its derivatives are the most commonly observed abnormal Hb pattern and found to be predominant among Rajbanshis followed by Beta thalassemia trait.

CONCLUSIONS

Pre-marital screening plays a very important role in prevention of haemoglobinopathies. This observation emphasizes the importance of large-scale community-based awareness programme, campaign and carrier screening programme to reduce the burden of this global health problem in North Bengal.

KEYWORDS: Haemoglobinopathy, Medical & Paramedical Students

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INTRODUCTION

Anaemia still remains one of the most important public health challenges with global impacts, especially in developing countries like ours. It is defined as a reduction in total circulating red cell mass below normal limits. Prevalence of anaemia in all age groups is higher in India as compared to other developing countries. Anemia is affected by many factors including ethnicity, gender, age, socio-demographic status, dietary habits and environment. Iron deficiency accounts for about half the world's anemia burden. The cumulative gene frequency of haemoglobinopathies in India is 4.2%. The highest prevalence of HbE syndrome has been reported in South-East Asia. In India, HbE is found to be prevalent mostly in North-Eastern states mainly restricted to West Bengal, Assam, Nagaland, Manipur, Tripura and Meghalaya showing an average allele frequency of 10.09%.

The medical and paramedical students coming from different socioeconomic cultural and geographic region of the country may acquire anaemia because of away from home for long duration, hectic schedule of training period, erratic life style and irregular eating habits during their student-hood. Screening program should be implemented to identify asymptomatic carrier of hemoglobin disorder in young population for prevention of high risk marriages. Various options available are: 1) Screening of school going children, 2) Screening of high risk communities, 3) Premarital screening, 4) Extended family screening – screening of relatives if there is a thalassemic child in a family and 5) Routine antenatal screening in early pregnancy ideally between 10 and 12 weeks. Our study was undertaken to screen these clinically silent entities among young medical and paramedical students of this college who are likely to make their family in recent future. It was more easier to counsel and motivate these students based on their Hb variant status and thereby high risk marriages and birth of a transfusion dependent child for life can be prevented.

MATERIALS AND METHODS

The cross-sectional study was carried out at Department of Pathology, North Bengal Medical College with the help of the Thalassemia control Unit from 01.04.2016 to 31.03.2017 on 500 Undergraduate, Postgraduate medical students and Paramedical students of North Bengal Medical College. Several campaigns were conducted aiming to increase the awareness among the college students. Those students giving informed consents were examined following WHO criteria of haemoglobin concentration for diagnosis and assessment of severity of anaemia (Hb <13 g% for male and <12 g% for female). The **demographic profile** of the participants like name, age, sex, religion, caste, sub-caste, educational qualification, marital status, full address and in case of married women, the premarital religion, caste and sub-caste were noted. Details of **personal history** regarding symptoms and sign of anaemia, addiction and occupation were documented. In absence of facility like genetic study, **proper family history** like presence of any inherited blood disorder in family or any family history of blood transfusion is necessary to interpret laboratory tests. **Clinical features** of relevance which included the presence of pallor, jaundice, skeletal deformities, hepatomegaly, splenomegaly, gum hypertrophy, skin color, facial features like malar prominence, frontal bossing, depressed nasal bridge, mal-occlusion of teeth had been noted. **Weight and height** were taken for each participant. Information regarding the per capita income (in rupees/month) was collected and the **socio-economic status** was classified by using the Modified B G Prasad's classification for the study period (2016–2017), intravenous blood sample was used for making the peripheral blood smear, run on the automated cell counter (SYSMEX KX 21) to obtain the complete hemogram and later employed for the screening of hemoglobinopathies using HPLC (β-thalassemia short program). ***P*-value** less than 0.05 is considered significant and value less than 0.001 is considered highly significant.

Aims & Objectives

The aim of the study was to determine the occurrence of anaemia among medical and paramedical students of North Bengal Medical College and its correlation with body mass index and socio-economic status. The objectives were to classify anaemic individuals morphologically and to study the occurrence of Haemoglobinopathies among same students and its correlation with haematological parameters.

RESULTS AND ANALYSIS

Table 1: Clinical Finding Observed in the Subjects

Clinical Finding	Number of Study Subjects	% of Study Subjects
Weakness	19	3.8%
Dizziness	19	3.8%

Table 1: Contd.,		
Body ache	5	1%
Jaundice	3	0.6%
Anorexia	5	1%
Asymptomatic	449	89.8%
Total	**500**	**100%**

Majority of study subjects 449 (89.8%) were asymptomatic and rest of the students presents with weakness, dizziness, body ache, jaundice, etc.

Table: 2. Distribution of Anaemia among Subjects

Anaemia	Male	Female	Total and (%)
Present	95 (28.79%)	67 (39.41%)	**162 (32.4%)**
Absent	235 (71.21%)	103 (60.59%)	**338 (67.6%)**
Total	**330 (100%)**	**170 (100%)**	**500 (100%)**

Anaemia was observed in 162 (32.4%) students. Out of total 500 students 95 (28.79%) males and 67 (39.41%) females were anaemic.

Table 3(a): Distribution of Anaemia in different Grade of BMI

Anaemia	BMI			Total and %
	Under Nutrition	Normal	Pre-obese	
Present	13 (81.25%)	133 (30.30%)	16 (35.56%)	**162 (32.4%)**
Absent	3 (18.75%)	306 (69.70%)	29 (64.44%)	**338 (67.6%)**
Total	**16 (100%)**	**439 (100%)**	**45 (100%)**	**500 (100%)**

Anaemia was more prevalent among the students who were underweight and pre-obese.

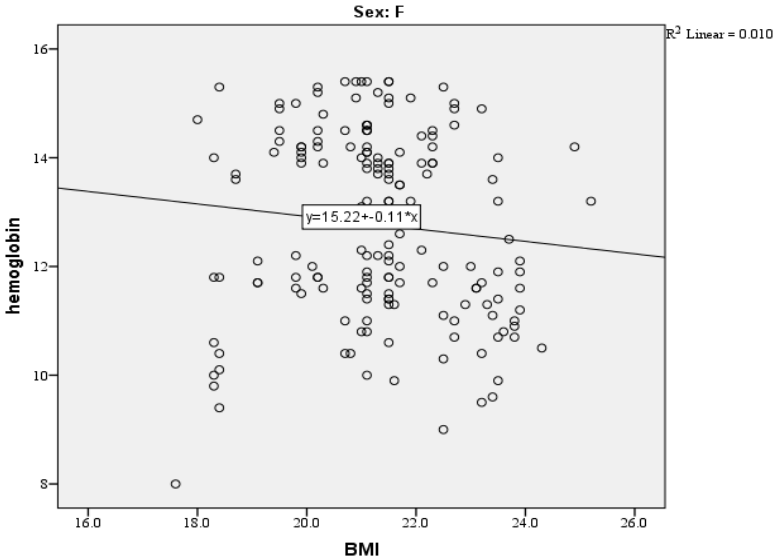

Figure 1: Correlation between Haemoglobin and BMI in Female.

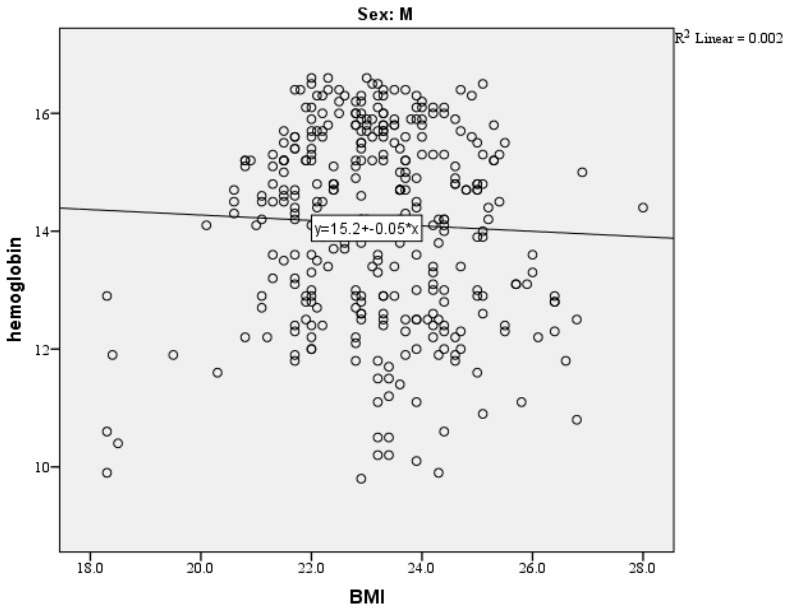

Figure 2: Correlation between Haemoglobin and BMI in Male.

Table 3(b): Correlation of BMI with Haemoglobin

Male		Female	
R	***P***	***r***	***P***
-0.043	0.441	-0.102	0.184

After analysis, no statistically significant correlation was found between BMI and haemoglobin.

Table 4: Distribution of Anaemia in different Socio-Economic Class

Anaemia	Socio-Economic Status					Total
	Upper Class ***(≥Rs.6346)***	**Upper Middle Class** ***(Rs.3173 -6345)***	**Middle Class** ***(Rs.1904-3172)***	**Lower Middle Class** ***(Rs.952-1903)***	**Lower Class** ***(≤Rs.951)***	
Present	45 (30.41%)	78 (31.20%)	36 (36.36%)	3 (100%)	0 (0%)	162 (32.4%)
Absent	103 (69.59%)	172 (68.80%)	63 (63.64%)	0 (0%)	0 (0%)	338 (67.6%)
Total	148 (100%)	250 (100%)	99 (100%)	3 (100%)	0 (100%)	500 (100%)

Table 5: Morphological Pattern of Anaemia (n=500)

Morphology	Anaemic	Nom-anaemic	Total and %
Normocytic Normochromic	50 (30.86%)	288 (85.21%)	**338 (67.6%)**
Dimorphic	37 (22.84%)	21 (6.21%)	**58 (11.6%)**
Microcytic Hypochromic	73 (45.06%)	26 (7.69%)	**99 (19.8%)**
Macrocytic Normochromic	2 (1.23%).	3 (0.89%)	**5 (1%)**
Total	**162**	**338**	**500 (100%)**

Majority had Normocytic Normochromic with 67.6% followed by Microcytic Hypochromic with 19.8% and dimorphic with 11.6% while 1% of subjects had Macrocytic anemia.

Table 6: Morphological Pattern among Anaemics (n=162)

Morphology	Male	Female	Total and %
Normocytic Normochromic	36	14	**50 (30.86%)**
Dimorphic	14	23	**37 (22.84%)**
Microcytic Hypochromic	44	29	**73 (45.06%)**
Macrocytic Normochromic	1	1	**2 (1.23%)**
Total	**95**	**67**	**162 (100%)**

Among 162 anaemic students, Microcytic Hypochromic was found in 45.06%, 30.86% had Normocytic Normochromic, dimorphic in 22.84% and Macrocytic anaemia in 1.23%.

Table 7: Haemoglobinopathy in Microcytic Hypochromic anaemic (n=73)

Haemoglobinopathies	Male	Female	Total and %
Present	32	17	**49 (67.12%)**
Absent	12	12	**24 (32.88%)**
Total	**44**	**29**	**73(100%)**

Among Microcytic Hypochromic anaemia of anaemic students (73), haemoglobinopathies are found in 49 (67.12%) subjects.

Table 8. Haemoglobinopathies in Anaemics and Non-Anaemics

Abnormal Hb	Anaemic (n=162)	Non-Anaemic (n=338)
Hb E Trait (ET)	30	21
Hb E Disease (ED)	10	0
Beta Thalassemia Trait (BTT)	15	3
Inconclusive	2	5
Total	**57 (35.18%)**	**29 (8.58%)**

Haemoglobinopathies were known to be more common among anaemic. In our study, the anaemic group showed a higher occurrence of abnormal haemoglobin pattern (35.18%) as against 8.58% in the non-anaemic groups.

Table 9: Distribution of Normal and Abnormal Haemoglobin Pattern

Haemoglobin Pattern	Male	Female	Total and % of Total Cases
Hb E Trait (ET)	35	16	**51 (10.2%)**
Hb E Disease (ED)	5	5	**10 (2%)**
Beta Thalassemia Trait (BTT)	11	7	**18 (3.6%)**
Inconclusive	6	1	**7 (1.4%)**
Normal	273	141	**414 (82.8%)**
Total	**330**	**170**	**500 (100%)**

Table 10: Distribution of Haemoglobinopathies in different Ethnic Groups

	RAJ (62)	HB (271)	M (101)	HBM (40)	HT (20)	A (06)	Total
ET	**27** (43.55%)	**12** (4.43%)	**09** (8.91%)	**0** (0%)	**03** (15.0%)	**0** (0%)	**51**
ED	**07** (11.29%)	**03** (1.11%)	**0** (0%)	**0** (0%)	**0** (0%)	**0** (0%)	**10**
BTT	**03** (4.84%)	**07** (2.58%)	**04** (3.96%)	**03** (7.50%)	**0** (0%)	**01** (16.67%)	**18**
Total	**37**	**22**	**13**	**03**	**03**	**01**	**79**
% of abnormal Hb patterns	**46.84**	**27.85**	**16.45**	**3.80**	**3.80**	**1.26**	**100**
% of total 500 cases	**7.40**	**4.40**	**2.60**	**0.60**	**0.60**	**0.20**	**15.8**

The population pattern of North Bengal can be represented in six ethnic/population group as outlined by Arthur J. Dash. This includes (a) Rajbanshi (R); (b) Hindu Bengali (HB); (c) Hindu Bihari Marwari (HBM); (d) Muslim (M); (e) Hill Tribes including Nepalese and other hill population; (f) Adivasis (A). In this study, out of 79 abnormal variants 37 (46.84%) were Rajbanshi, 22 (27.85%) Hindu Bengali, 13 (16.45%) Muslim, 3 (3.80%) each in Hindu Bihari Marwari, and Hill Tribes and 1 (1.26%) in Adivasis.

Table 11: HbE and its Derivatives among Rajbanshi and other Ethnic Group.

Ethinic Groups	HbE and its Derivatives	Other Variants + Normal + B/L	Total	Statistical Analysis
Rajbanshi	***34***	***28***	***62***	**Odd' ratio 18.48**
Others	***27***	***411***	***438***	**P value < 0.000000***

*statistically significant

Of all HbE derivatives, 54.84% occurs in the Rajbanshis, indicating a strong association between the Rajbanshis and the occurrence of HbE haemoglobinopathies, which is statistically highly significant (Odds ratio = 18.48 and *p*-value <0.001) in comparison to the other ethnic groups.

SUMMARY

A total of 500 samples from all students were studied, which showed preponderance of males with 66% (n=330) and females were 34% (n=170). Among 330 males, 95 (28.79%) are anaemic and females 67 (39.41%) are anaemic of total 170 females. As a whole 162 were found to be anaemic. That is, 32.4% of the total samples studied were anaemic. Majority of study subjects 449 (89.8%) were asymptomatic. Most common morphological pattern of anaemia was normocytic normochromic (67.6%) followed by microcytic hypochromic (19.8%), dimorphic(11.6%) and macrocytic normochromic (1%). Most common morphological pattern among anaemics observed were microcytic hypochromic (45.06%), followed by normocytic normochromic (30.86%), dimorphic (22.84%) and macrocytic normochromic (1.23%). There was no significant difference ($p > 0.05$) in haemoglobin concentration among the BMI groups, except for the underweight subjects who had significant anaemia. There was no significant association was found between socioeconomic status and anaemia. In present study, one of the important and distinguished observations is co-existence of haemoglobinopathies with and without presence of anaemia. Among 162 anaemics 57(35.18%) and among 338 non-

anaemics 29(8.58%) have abnormal Hb disorder. Among abnormal (79 cases) variants, 51(64.56%) cases were HbE trait, 10(12.66%) were HbE disease and 18(22.78%) cases were Beta Thalassemia Trait. HbE trait, HbE disease and BTT run a milder course and most of them are clinically asymptomatic except for weakness and pallor attributed to microcytosis and hypochromia associated with them. It was found that HbE and its derivatives occurred in rajbanshi population is (54.7%) indicating a strong association between the rajbanshis and occurrence of HbE haemoglobinopathies.

The geographical clustering of the haemoglobinopathies were once considered to be rampant within distinct races or communities due to various factors like caste endogamy, consanguinity, migration of people, and increase in marriages between different population groups. These factors have highly compounded the already complex phenomena of HbE disorders and Beta thalassemia syndromes. This is reflected in this study, by the fact that, apart from the Rajbanshis, fair numbers of cases have been diagnosed with HbE syndromes among other ethnic groups of this region, notably the Hill tribes and Muslims.

Due to ethnic diversity of this region and lack of awareness among the masses, morbid conditions like the Beta Thalassemia Major, Hb E–β Thalassemia, Hb S Disease, Hb S–β Thalassemia can result due to the marriage between asymptomatic carriers of HbE, HbS with a Beta thalassemia carrier. This is where the importance of ***pre-marital screening*** as a preventive tool lies.

CONCLUSIONS

Anaemia is prevalent and is neither related to Body Mass Index nor Socioeconomic Status. Red cell indices as well as careful examination of well stained peripheral blood smear are valuable in the morphological classification of anemias. A proper clinical, hematological and biochemical correlation is required for the accurate diagnosis and effective treatment of anemia, thus highlighting the need for a screening for the causes of anemia in this population. HbE and its derivatives are found to be the most frequently occurring haemoglobinopathies in this study population. Rajbanshis are the ethnic group of high risk with a statistically significant relationship with the occurrence of HbE hemoglobinopathies. The occurrence of abnormal hemoglobin pattern with devastating clinical profile like Beta Thalassemia Major, Hb E–β Thalassemia, Hb S Disease, Hb S–β Thalassemia can be reduced by preventing the interaction between an asymptomatic Hb E and Beta thalassemia trait through ***pre-marital screening*** and counseling. Above all, the need of the hour is to implement community based education program, thalassemia campaigns and screening camps to prevent this type of hereditary conditions.

RECOMMENDATIONS

Medical and paramedical students are as gems for medical college. There should be some programme to fulfill their nutritional requirement. Students should go for routine haemoglobin analysis to keep an eye on their haemoglobin level. Student-based mass screening program should be launched on a large scale for highly prevalent haemoglobinopathies.

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